Intelligence as domain talent determined by complexity and developable in specific areas

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Abstract

In response to the documented limitations of traditional IQ tests—cultural bias, reification of the *g* factor, ignorance of developmental plasticity, and self-fulfilling prophecy effects—an alternative proposal is presented, grounded in contemporary research on the development of expertise. This proposal conceives intelligence not as a fixed general capacity, but as a set of domain-specific talents, each defined by the structural and functional complexity of the tasks specific to a field of application (mathematics, music, sport, leadership, etc.). Talent is not considered a static attribute but a developmental potential that emerges from the interaction between biological predispositions and a facilitating talent niche that provides deliberate practice, high-quality feedback, motivational scaffolding, and progressive exposure to increasing levels of complexity. A dynamic domain-specific assessment model is proposed that measures the rate of learning under optimal conditions, rather than the static baseline level. Implications for education, vocational guidance, and work organization are discussed, advocating for systems that cultivate diverse talents rather than classifying people by a single number.

Keywords: domain talent, complexity, deliberate practice, talent niche, dynamic assessment, expertise development.

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1. Introduction: Why We Need an Alternative

Criticism of IQ tests does not imply abandoning the assessment of human potential, but rather radically rethinking it. The question is not whether people differ in their abilities—obviously they do—but how to describe those differences in a useful, fair, and scientifically sound manner, and how to create conditions for each person to fully develop their specific talents.

The IQ model fails because:

- It unidimensionalizes what is multidimensional.

- It reifies what is dynamic and contextual.
- It stigmatizes with fixed labels that operate as self-fulfilling prophecies.
- It ignores the central role of the environment and practice in the development of excellence.

The alternative we propose is based on three fundamental premises:

1. **Domain-specificity:** Outstanding performance in one area (chess, violin, surgery, programming) neither predicts nor is predicted by performance in very different areas. Skills are local, not global.
2. **Complexity as an organizer:** What characterizes "talent" is the ability to handle increasing levels of complexity within a domain—complexity of patterns, relationships, temporality, uncertainty, and interdependence.
3. **Developability:** Talent is not a fixed gift but a trajectory of improvement that critically depends on opportunities for deliberate practice, feedback, and motivational support. Potential is the slope of the learning curve, not the initial height.

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2. Fundamental Concept: Domain Talent

2.1 Definition

We define domain talent as a person's ability to effectively handle tasks of increasing complexity in a specific field of activity, manifested through high learning rates when optimal conditions of practice and feedback are provided.

This definition implies:

- **Specificity:** There is no "general talent." A person can be talented in medical diagnosis and mediocre in chess.
- **Complexity as axis:** Talent levels correspond to the levels of complexity that the person can process fluently.
- **Potential as rate of change:** The true indicator is not the current level (biased by prior opportunities) but the speed of improvement when training conditions are equalized.

2.2 Complexity as a Structurer of Talent Levels

The notion of complexity has been formalized in multiple domains. For example:

- **In mathematics:** from basic arithmetic to reasoning in Hilbert spaces.
- **In music:** from reproducing simple rhythms to polyphonic improvisation in real time.

- **In sports:** from individual ball control to reading tactical systems with 21 moving players.
- **In management:** from supervising routine tasks to directing complex organizations with multiple stakeholders and strategic ambiguity.

I propose that complexity can be decomposed into cross-cutting dimensions (although their combination is domain-specific):

- **Pattern complexity:** number of elements that must be integrated into a mental representation.
- **Temporal complexity:** planning horizons, anticipation of sequences, working memory.
- **Relational complexity:** non-linear interdependencies, feedback loops.
- **Contextual complexity:** environmental variability, need for real-time adaptation.
- **Uncertainty complexity:** handling incomplete or probabilistic information.

Domain talent manifests as the ability to operate fluently at higher levels of these dimensions without performance degradation.

2.3 Relationship with Research on Expertise

The proposal is supported by the extensive literature on the development of expertise, initiated by the work of Ericsson and colleagues. Ericsson (1993, 2018) demonstrated that:

- Exceptional performance in domains such as music, chess, or sports requires at least 10 years of deliberate practice (about 10,000 hours, although the exact number varies by domain).
- Deliberate practice involves: (a) tasks specifically designed to improve concrete aspects of performance, (b) immediate and detailed feedback, (c) opportunity to repeat and correct, (d) sustained effort beyond the comfort zone.
- No solid evidence of fixed limits to improvement has been found; what limits is not a "talent ceiling" but the quality and quantity of deliberate practice.

The main difference with the proposal presented here is that Ericsson minimizes the role of initial individual differences ("gifts"). We adopt an intermediate position: biological predispositions exist (genetic and epigenetic) that facilitate entry into certain practice niches—for example, height for basketball, auditory sensitivity for music, working memory for chess—but emergent talent is the result of the interaction between those predispositions and the quantity/quality of deliberate practice in a facilitating niche. In the absence of the niche, the

predisposition does not manifest; with an exceptional niche, people with modest predispositions can reach very high levels.

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3. The Talent Niche: Conditions for Development

3.1 Definition of Talent Niche

Adapting the concept of "developmental niche" from Bronfenbrenner and Ceci (1994), we define **talent niche** as the set of environmental conditions that facilitate the development of a specific talent in a given domain. A talent niche includes:

1. **Access to deliberate practice:** Tasks graded by levels of complexity, with sufficient and varied repetition.
2. **High-quality expert feedback:** Immediate, specific, oriented towards improvement and not towards global evaluation.
3. **Motivational scaffolding:** Positive reinforcement, role models, celebration of small achievements, management of failure as learning.
4. **Material resources:** Instruments, spaces, technology adequate for the domain.
5. **Protected time:** Daily hours dedicated to deep practice without interruptions.
6. **Community of practice:** Interaction with peers of similar or higher level, cooperative competition.

3.2 Inequality of Niches as the Main Source of Observed Differences

The evidence reviewed in the critique of IQ shows that facilitating environments (parents with higher education, schools with personalized attention, extracurricular activities, travel) provide exactly these components of the talent niche. Conversely, disadvantaged environments lack them. Therefore, observed differences in performance do not reflect differences in "innate talent" but differences in the quality of the talent niche available during childhood and adolescence.

This hypothesis is testable: if we equalize talent niches (same training, same feedback, same support) over an extended period, initial performance differences would tend to decrease, and the rate of improvement (learning slope) would become the best predictor of final performance. Some studies in educational and sports contexts support this prediction (see section 5).

3.3 Plasticity Throughout Life

Although early childhood is a sensitive period (not critical) for the development of certain domains (language, basic musical skills), evidence shows substantial plasticity in adulthood. Adults who start late in a domain can reach very high levels (not always world elite, but certainly excellence) if they have access to an intensive talent niche. Examples: the pianist who starts at 18 (like many jazz musicians), the chess player who achieves the title of master at 40, the self-taught programmer who becomes a senior engineer. This reinforces the idea that talent is developable, not fixed.

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4. Alternative Assessment: Domain Talent Profile and Dynamic Evaluation

4.1 Principles of the New Assessment

In contrast to the single IQ test, we propose an assessment system based on:

1. **Mandatory multidimensionality:** Separate domains are evaluated (mathematical, verbal-argumentative, spatial, musical, kinesthetic, interpersonal, intrapersonal, etc.). They are not aggregated into a single number.
2. **Dynamic assessment:** Instead of measuring baseline level, the capacity for learning is measured through a test-training-retest format or through the slope of improvement over repeated sessions with feedback.
3. **Contextualization of the prior niche:** The history of opportunities (years of practice, quality of instruction, available resources) is documented to interpret the current level as a product of talent × niche, not just talent.
4. **No fixed labels:** Results are communicated as "starting points" and "observed improvement slopes," not as "IQ 115." Deficit language is avoided.

Complexity Level	Task Type	Threshold Score
1 (Basic)	Mentally rotate a simple 2D figure and match	90% accuracy
2	Rotate 3D figure with 3 elements	85% accuracy
3	Mental rotation of asymmetrical objects; folding 3D nets	80% accuracy

Complexity Level	Task Type	Threshold Score
4	Mental manipulation of configurations with obstacles and multiple rotations	75% accuracy

4.2 Proposed Instruments

For each domain, batteries of tasks graded by complexity levels are designed. Example for the spatial reasoning domain:

The evaluatee starts at a low level until reaching a level of "frustration" (below threshold). The level of complexity reached is the first indicator. Then, a 30-60 minute training phase is introduced with explicit feedback and strategies. Retesting is done with equivalent (not identical) tasks at the same level. The gain (how many additional levels are surpassed after training) is the indicator of developmental potential.

4.3 Advantages Over IQ

- **Informative for intervention:** Knowing that a child has a high learning slope in spatial reasoning but not in verbal allows directing resources to strengthen their strength, not to compensate for the "deficit."
- **Less cultural bias:** Explicit training during the test equalizes opportunities for those who have not had prior exposure to that type of task.
- **Reduces the Pygmalion effect:** By reporting results as "improvement slope" instead of "IQ level," the fixed label that triggers self-fulfilling prophecies is avoided.
- **Motivational:** Evaluatees see that they can improve with practice, fostering a growth mindset.

4.4 Limitations and Precautions

Dynamic assessment is not a panacea. It requires specialized trainers, is more costly than a pencil-and-paper test, and its long-term predictive validity still needs more research. However, its foundations are more solid than those of static IQ, especially in contexts of cultural diversity and inequality of opportunity.

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5. Implications for Education, Work, and Social Policy

5.1 Education: From Classification to Cultivation

The current educational system, especially in models such as "talent education" or "gifted schools," often selects early using IQ tests. This produces:

- **False negatives:** Children with non-academic talents (kinesthetic, interpersonal, artistic) are excluded from enrichment programs.
- **False positives:** Children with facilitating environments but without specific talent are labeled as gifted and may suffer pressure and subsequent failure.

The alternative proposal advocates for:

- **Rotational exploration of domains:** All children go through brief units (4-6 weeks) of different domains (mathematics, music, visual arts, programming, debate, design, etc.).
- **Identification of improvement slopes:** During each unit, individual learning rate is measured, not absolute level.
- **Flexible grouping by domain and complexity level:** A child can be at level 7 in mathematics and level 3 in music, without global labels.
- **Elimination of the "gifted" category as a fixed label:** Replaced by "has shown a high rate of improvement in these domains, and therefore advanced opportunities are offered in them."

5.2 Job Selection: Assessment through Work Samples and Probationary Periods

Instead of using IQ tests to filter candidates, organizations can:

- Use authentic work samples (performing tasks similar to those of the position) evaluated by experts.
- Implement probationary periods of 2-4 weeks with feedback and training, measuring the rate of learning.
- Abandon the practice of filtering by general cognitive ability tests, given that their predictive validity is low once range restriction is controlled for and their adverse impact is high (Berry et al., 2024).

5.3 Social Policy: Equalizing Talent Niches

The most radical conclusion of this proposal is that the main source of inequality in talent is not genetic, but the unequal distribution of talent niches. Therefore, public policies should:

- Ensure that all children have access to: (a) quality early education with a focus on deliberate practice; (b) varied subsidized extracurricular activities

(music, sports, art, science); (c) trained mentors; (d) adequate nutrition and health.
- Implement "talent catch-up" programs for adolescents from disadvantaged backgrounds, offering intensive niches (scholarships, boarding schools, personalized training) that allow them to develop their potentials.
- Evaluate the impact of these policies by measuring the evolution of participants' learning slopes, not just static scores.

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6. Comparison with Other Alternative Models

Characteristic	**IQ / *g* Factor**	**Multiple Intelligences (Gardner)**	**Expertise (Ericsson)**	**Domain Talent + Niche (Proposal)**
Unit of analysis	Person (total IQ)	Intelligence type (e.g., musical)	Domain (chess, violin)	Domain + complexity level
Stability	High (fixed trait)	Moderate	Low (improves with practice)	Moderate (individual slope)
Influence of environment	Recognized but minimized	Recognized but without mechanism	Central (deliberate practice)	Central (talent niche)
Prediction of success	School performance	Low	High in specific domains	Learning slope
Utility for intervention	Low (fixed label)	Moderate (but hard to measure)	High (design practice)	High (adjust niche and level)

Characteristic	IQ / *g* Factor	Multiple Intelligences (Gardner)	Expertise (Ericsson)	Domain Talent + Niche (Proposal)
Cultural bias	High	Moderate (depends on domain)	Low (if practice is equalized)	Low (dynamic assessment)

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7. Research Agenda

To validate and refine this proposal, the following research lines are needed:

1. **Longitudinal intervention studies:** Randomly assign children from disadvantaged environments to intensive talent niches vs. standard education, measuring learning slopes in multiple domains over 5-10 years.
2. **Development of dynamic assessment instruments for specific domains:** Standardization of batteries with training phases, establishing norms of improvement slope by age and domain.
3. **Heritability studies of the learning slope:** If the learning slope (under optimal conditions) is more heritable than baseline level, this would support the existence of specific biological predispositions; if it is scarcely heritable, it would support the pure deliberate practice model.
4. **Predictive validity studies:** Compare the capacity of static IQ vs. dynamic learning slope to predict actual achievements (educational, occupational, creative) at 10 years.
5. **Cost-effectiveness analysis of talent niches:** Determine what intensity and duration of intervention produces the greatest gains per unit of resource invested.

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8. Response to Foreseeable Objections

Objection 1: "If there is no general factor, how do we explain the positive correlations between tests?"

Response: Correlations are explained by method factors (response style, test anxiety, familiarity with the test format) and by shared exposure to Western schooling and culture. When schooling is controlled for and very different tests are used (e.g., mental rotation vs. vocabulary vs. working memory), correlations drop drastically. The *g* factor is an artifact of the correlation matrix, not a cause.

Objection 2: "What about savants with low IQ and exceptional talent in one domain? Doesn't that contradict specificity?"

Response: On the contrary, savants are the best evidence in favor of specificity. Their existence demonstrates that one can be exceptional in music or calculation without general intelligence. If the *g* factor were real, that would be impossible.

Objection 3: "Dynamic assessment is more expensive and slower; IQ tests are practical."

Response: Practicality does not justify injustice. Using a cheap but invalid instrument for high-impact decisions is ethically unsustainable. Moreover, dynamic assessment can be done in adaptive computerized format, reducing costs. The cost of mislabeling a child for their entire life is much higher.

Objection 4: "In elite sports, some children with the same training go further; that proves innate talent."

Response: Differences in response to the same training may be due to multiple factors: biological maturation (biological vs. chronological age), prior injuries, differences in initial motivation (already shaped by previous experiences), and yes, also genetic differences in muscle structure, aerobic capacity, etc. But those genetic differences are domain-specific (height for basketball, muscle fiber type for sprints) and do not constitute a general factor. Furthermore, a child who responds worse to one type of training may respond better to another approach. The "same training" does not really exist because coaches treat children differently according to expectations (Pygmalion effect).

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9. Conclusion: Towards a Fairer and More Effective Science of Human Potential

The proposal outlined here does not deny individual differences in abilities. It affirms that these differences are multiple, domain-specific, and deeply shaped by developmental opportunities. It rejects the reduction of human complexity to

a single number, and offers a path to assess potential in a fairer and more useful way.

The implementation of this proposal requires a significant cultural and political shift. It demands abandoning the comfort of simple classifications and embracing the complexity of diverse talents. It demands investing resources in creating accessible talent niches for all, not in administering cheap tests that reproduce privileges. It demands training professionals skilled in dynamic assessment and in designing deliberate practice.

But the potential benefit is immense: a society that cultivates each person's specific talents, rather than classifying them in an IQ hierarchy; an education that discovers and strengthens, rather than selects and excludes; a science of intelligence that respects human dignity and plasticity.

Intelligence is not a gift that some possess and others do not. It is a potential for complexity that develops when conditions are adequate. Our task as researchers and professionals is to create those conditions.

References

- Berry, C. M., Lievens, F., Zhang, L., & Sackett, P. R. (2024). Overestimation of cognitive ability test validity: A critical review. *Journal of Applied Psychology*.
- Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualized in developmental perspective: A bioecological model. *Psychological Review*, 101(4), 568-586.
- Ceci, S. J. (1996). *On intelligence: A bioecological treatise on intellectual development*. Harvard University Press.
- Ericsson, K. A., & Pool, R. (2016). *Peak: Secrets from the new science of expertise*. Houghton Mifflin Harcourt.
- Feuerstein, R. (1979). *The dynamic assessment of retarded performers*. University Park Press.
- Flynn, J. R. (2012). *Are we getting smarter? Rising IQ in the twenty-first century*. Cambridge University Press.
- Gardner, H. (1983). *Frames of mind*. Basic Books.
- Richardson, K. (2017). *Genes, brains, and human potential*. Columbia University Press.
- Sternberg, R. J. (1999). Successful intelligence: Finding a balance. *Trends in Cognitive Sciences*, 3(11), 436-442.

- Tucker-Drob, E. M., & Bates, T. C. (2016). Large cross-national differences in gene × socioeconomic status interaction on intelligence. *Psychological Science*, 27(2), 138-149.